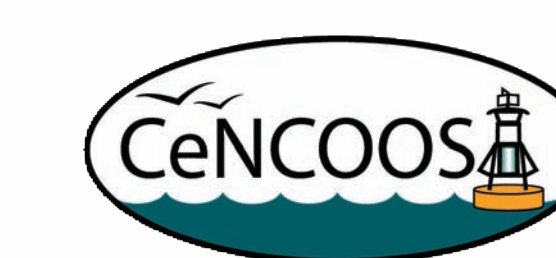


# The Center for Integrated Marine Technologies: Long-term Ocean Observing System in Monterey Bay Provides Oceanographic Data and Monitoring Information toward Improving the Understanding of Ocean and Coastal Ecosystems



<http://cimt.ucsc.edu>   [cimt@pmc.ucsc.edu](mailto:cimt@pmc.ucsc.edu)

Rondi Robison 1, Laura Beach 1, Heather Kerkering 2, Gary Griggs 1, Raphe Kudela 1, & Don Croll 1—1. University California Santa Cruz, 2. Central & Northern California Ocean Observing System

The Center for Integrated Marine Technologies' (CIMT) a project within the Central and Northern California Ocean Observing System (CeNCOOS) was organized to understand the relationship between the physical dynamics and productivity, from wind to whales, of California's coastal ocean.

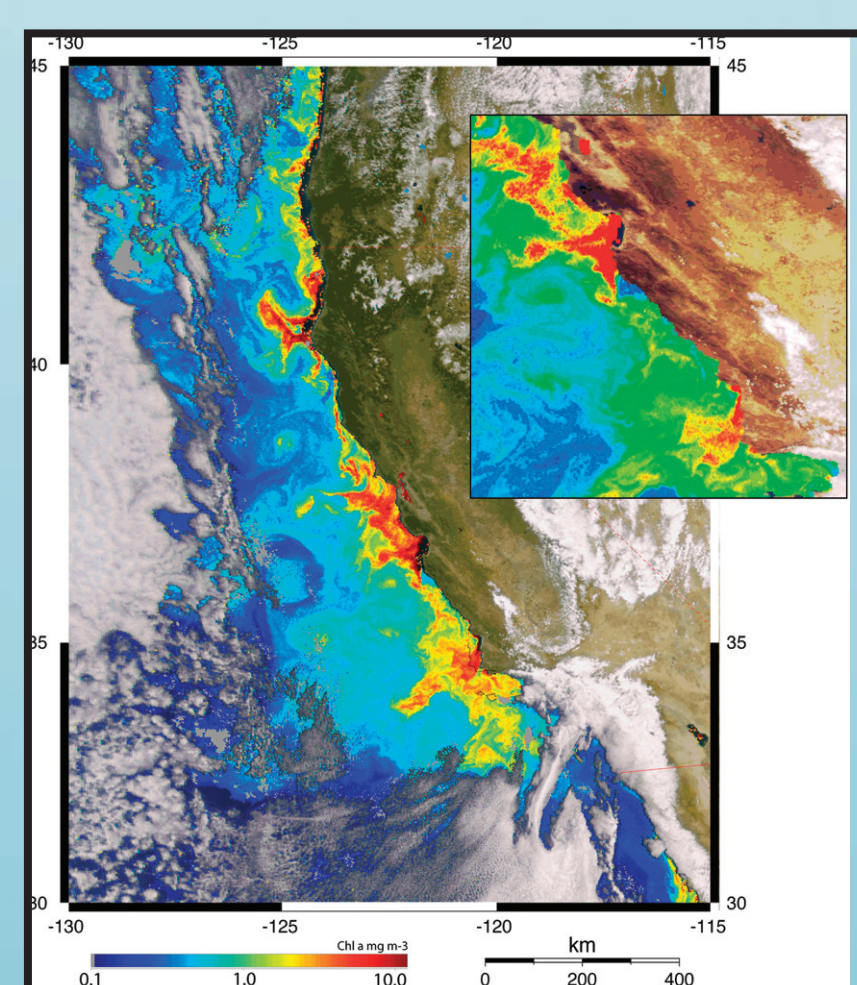
CIMT's mission is to create a coastal ocean observing and forecasting system that provides a scientific basis for the management and conservation of Monterey Bay, and serves as a model for monitoring all of California's coastal marine resources.

**CIMT can provide the California Ocean Protection Council (OPC) with an ecosystem based understanding of Monterey Bay to help inform the scientific understanding of ocean resources and ecosystem monitoring. Information on monitoring Monterey Bay is available and can prove valuable in the marine protected area process, water quality monitoring, restoring and maintaining ocean and coastal habitats and resources, and creating sustainable fisheries.**

**CIMT meets aspects of all the themes of the OPC's Strategic Plan**

- **Governance:** development of Ecosystem Based Management approaches
- **Research & Monitoring:** consistent monitoring of Monterey Bay since 2002
- **Ocean & Coastal Water Quality:** monitoring information for the enforcement of pollution controls
- **Physical Processes & Habitat Structure:** investigation on climate change
- **Coastal & Ocean Ecosystems:** resources on sustainable fisheries to support the Marine Life Management Act
- **Education & Outreach:** improving access and ocean information for predictive models of how marine resources responds to variability in coastal dynamics

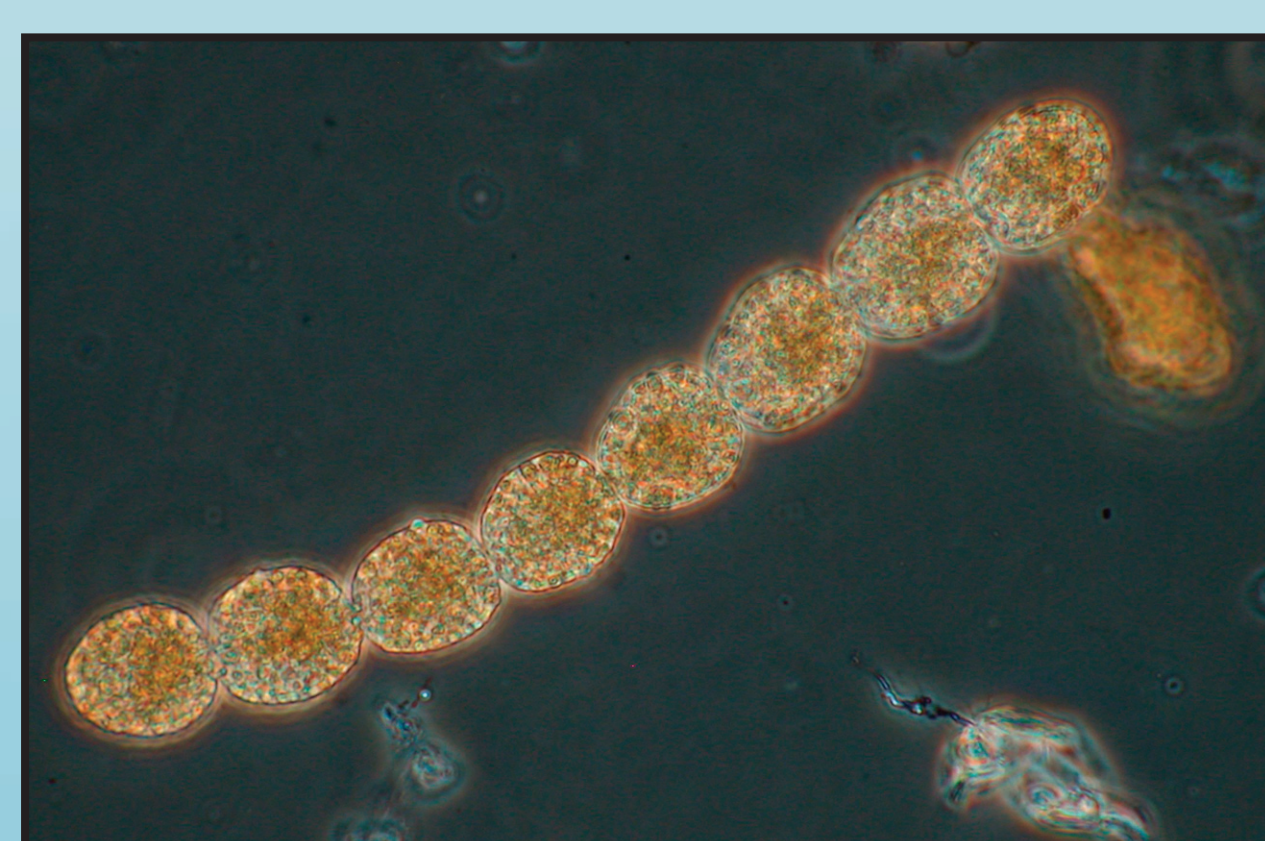
## Marine Protected Areas



(Ocean color satellite imagery - warmer colors indicate higher concentrations of phytoplankton with red being the highest concentrations: Raphe Kudela)

**Biodiversity** - The integration of ship surveys, apex predator tagging, and satellite information over time provide a better ecosystem based understanding within Monterey Bay from nutrients and phytoplankton production to zooplankton, fish, marine mammals, sea birds and sea turtles abundances and distributions.

## Toxic Phytoplankton



(*Cochodinium catenatum* algae: M. Silver)

Toxic diatoms and dinoflagellates in Monterey Bay are being studied to assess the abundance of the toxin-producing species; and their movement into local pelagic food webs and the associations of these intoxication events are being linked with local harmful algal blooms.

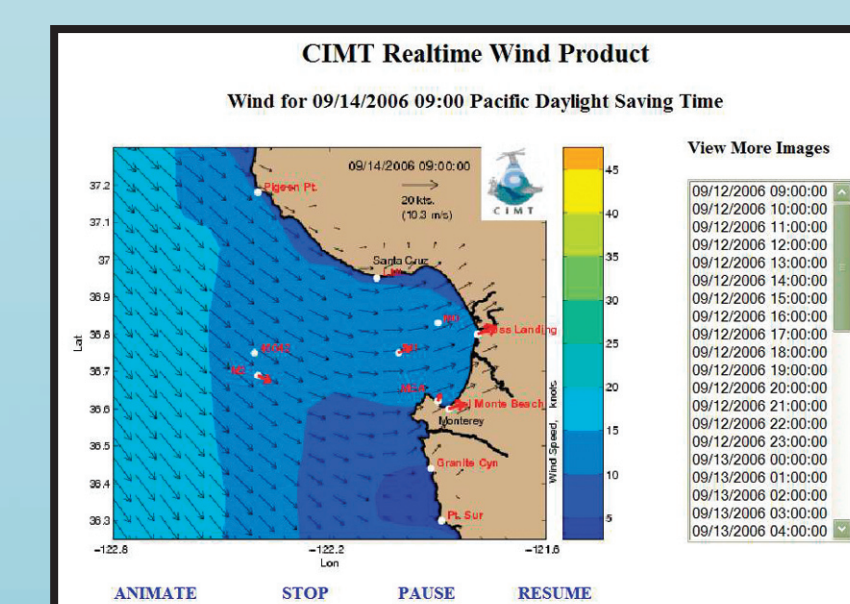
## River Impacts on the Coastal Ocean



(Matt Hurst collecting iron samples: R. Robison)

With the Central Coast Long-term Environmental Assessment Network (CCLEAN), we measure pathogenic bacteria and urea-nitrogen levels (indicative of inputs) to determine concentrations and the extent of harmful bacteria blooms during river discharge events.

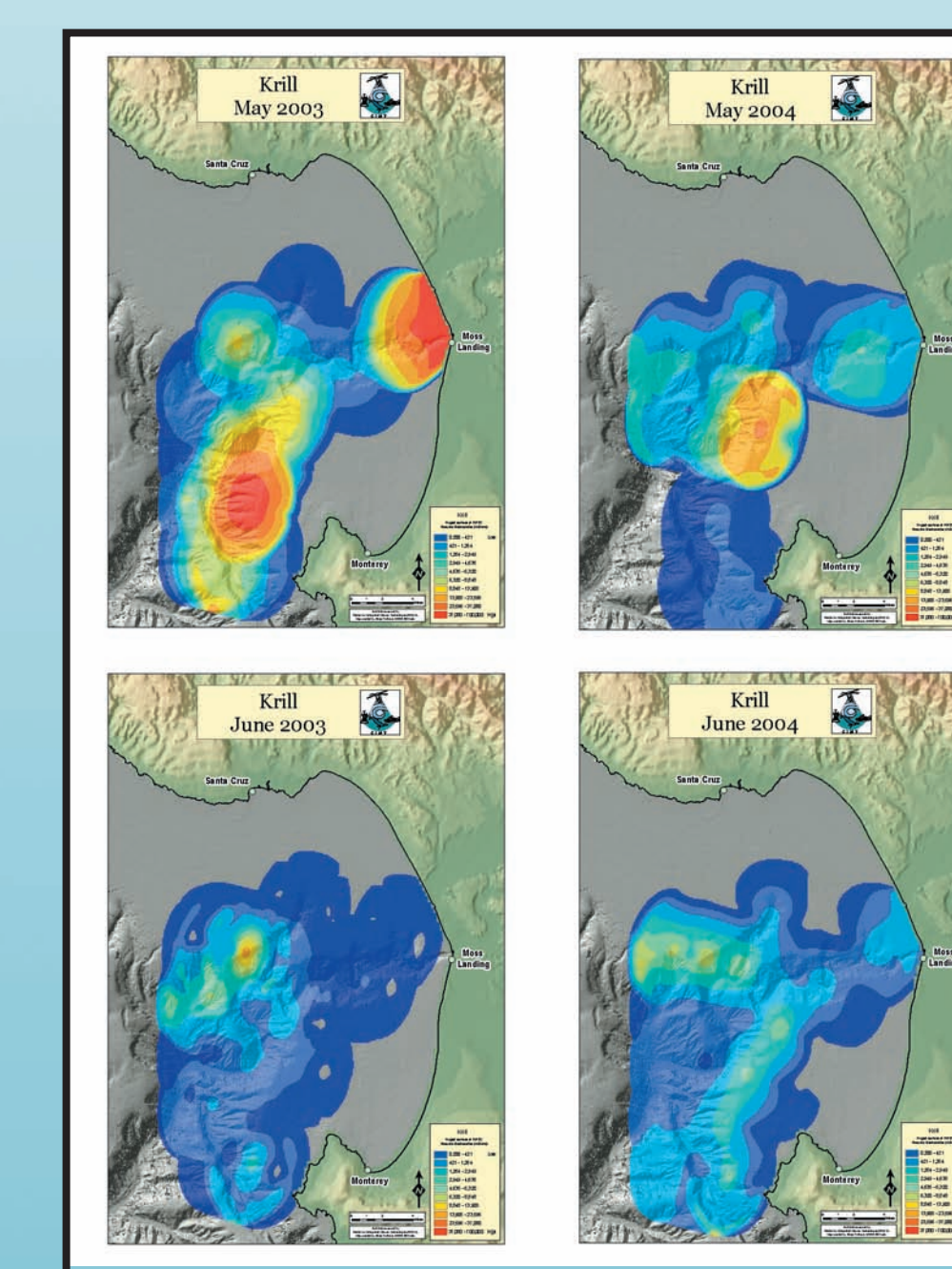
## Measuring & Predicting Wind & Currents



(Wind Patterns in the Monterey Bay Region: CIMT)

The direction, intensity, and duration of winds along the California coast largely determine nearshore climate, ocean productivity, and the movement and fate of human contaminants such as oil and pesticides. Coastal currents are closely linked to wind patterns and variability in wind and currents have significant repercussions for commercially important and protected species.

## Fisheries Management



(Krill abundance in the Monterey Bay 2003-2004: B.Fulfroost)

Krill is critically important to transferring energy from phytoplankton to commercially important and endangered species, and can vary dramatically due to variability in ocean climate (e.g. El Niño, La Niña). Analyses show that California sea lion impacts are important to consider for ecosystem based fisheries management of rockfish and salmon.

This effort has been simultaneously collecting data via moorings, shipboard surveys, apex predator tagging and tracking, and satellite, aircraft, and land-based remote sensing since 2002 and is built on a foundation of data since 1997.

CIMT core variables		
Physical	Chemical	Biological
Salinity	Dissolved nutrients	Fish abundance/biomass
Water temperature	Dissolved oxygen	Zooplankton species
Bathymetry	Carbon: total organic	Pathogens
Currents	Carbon: total inorganic	Phytoplankton species
Chlorophyll	Suspended sediments	Mammals: mortality
Bioacoustics	pCO <sub>2</sub>	Mammals: abundance
Optical properties	Total nitrogen: water	Chlorophyll
Ocean color		Phytoplankton abundance
		Phytoplankton productivity
		Bioacoustics

In its final report, the U.S. Commission on Ocean Policy proposed a list of core elements to be measured by the National Ocean Observing System (IOOS). CIMT currently measures 23 of 36 relevant variables.

### Acknowledgements:

Special thanks to Laura Beach, Erika Beyer, Geno Olmi, Becky Smyth, Gary Griggs, Raphe Kudela, Don Croll, Baldo Marinovic, Yi Chao, Leslie Rosenfeld, Scott Benson, Jim Harvey, Mike Cook, Todd Anderson, Peggy Li, Mary Silver, Sibel Bargue, Steve Lonhart, Josh Pederson, Ken Bruland, Dan Costa, Jeff Paduan, Francisco Chavez, Heather Kerkering, Kelly Newton, Nancy Gong, Mike Weise, Brian Fulfroost, Atma Roberts, Geoff Smith, Bettina Sohst, Carol Keiper, Sophie Webb, Walter Heady, Lee Bradford, Kurt Brown, Peter Miller, Susan Coale, David Revell, Brian McLaughlin, Itcheung Chung, Mark Carr, & John Largier.

Trophic Illustration: Erika Beyer